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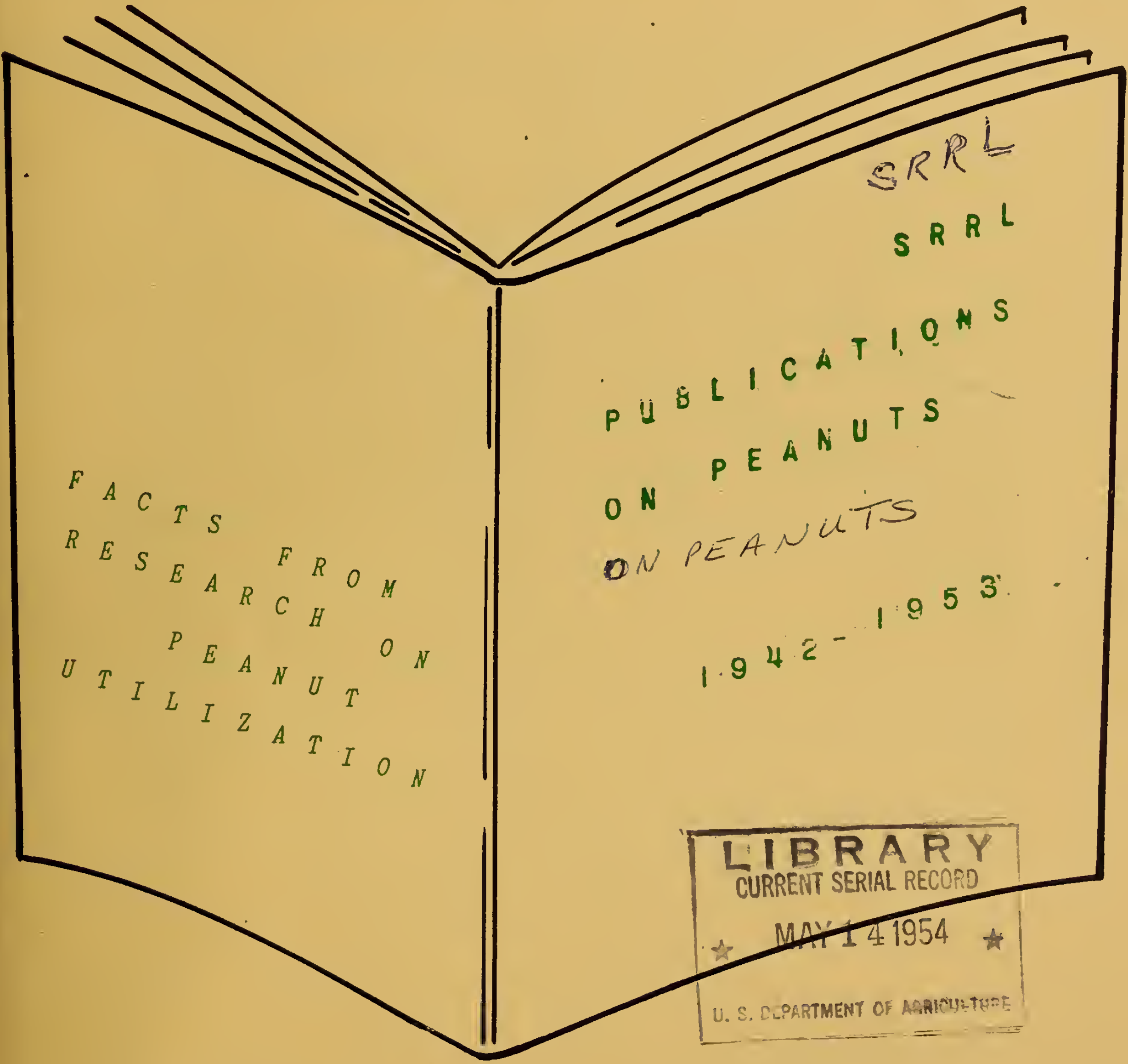

FACTS FROM RESEARCH ON PEANUT UTILIZATION

SRRL

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PUBLICATIONS ON PEANUTS

ON PEANUTS

1942-1953

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U. S. DEPARTMENT OF AGRICULTURE

SOUTHERN REGIONAL RESEARCH LABORATORY
SOUTHERN UTILIZATION RESEARCH BRANCH
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE

THE SOUTHERN REGIONAL RESEARCH LABORATORY is one of the 4 regional research laboratories authorized by Congress in 1938 to search for new or extended chemical, technological, and scientific uses for regional farm crops.

The aim of the Southern Utilization Research Branch is to increase the uses of crops grown in the Southern United States and in Puerto Rico. Commodities studied are cotton and cottonseed, sweetpotatoes, peanuts, sugarcane, citrus fruits, Southern vegetables, rice, and some minor Southern oilseeds.

G. E. Hilbert is Director of Utilization Research of the Agricultural Research Service. C. H. Fisher is Chief of the Southern Utilization Research Branch. A. M. Altschul, T. H. Hopper, and E. A. Gastrock are heads of 3 Research Sections of the Southern Regional Research Laboratory whose work includes peanut utilization investigations.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN UTILIZATION RESEARCH BRANCH
SOUTHERN REGIONAL RESEARCH LABORATORY
NEW ORLEANS 19, LOUISIANA

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To those interested in peanuts and peanut derivatives:

Here is your copy of our abstract bibliography entitled "SRRL Publications on Peanuts, 1942-1953: Facts from Research on Peanut Utilization" (AIC-369).

We hope that you find this booklet a handy reference to our reports of research on peanuts and peanut products. If you are interested in receiving a copy of any of the articles cited, please use the reverse side of this sheet to list them by the item numbers given in the bibliography, and we shall gladly send you copies, without charge.

Also, in the space provided, will you please write us your comments, especially concerning the usefulness to you of the information we have presented in this booklet?

We shall certainly appreciate hearing from you.

C. H. Fisher

Please fill in the information asked for below and mail to:

C. H. Fisher, Chief
Southern Utilization Research Branch
2100 Robert E. Lee Boulevard
New Orleans, Louisiana

Please send me the following items, listed in AIC-369, "SRRL Publications on Peanuts, 1942-1953: Facts from Research on Peanut Utilization":

Item Nos.

Name and address:

Comments:

IN THIS BOOKLET are indexed and abstracted 92 publications reporting new technical information on peanuts and peanut products -- the results of research conducted between 1942-1953 principally by the Southern Regional Research Laboratory of the Southern Utilization Research Branch, Agricultural Research Service, U. S. Department of Agriculture.

This abstract bibliography is intended to make these findings readily available to growers, processors, and others interested in extending or improving uses of peanuts and peanut derivatives. While one of the objectives of research is to develop new information, another is to make it accessible to whomever it can benefit.

Before this research was conducted, little systematic information was available on the processes and products of the peanut industry. Because of SRRL research there is now a rich store of information, much of it potentially applicable by industry and agriculture.

RESEARCH ON PEANUTS has been conducted by the Southern Utilization Branch since 1941. Goals are: To accumulate new facts on the nature and behavior -- composition, properties, and reactions -- of the peanut and its constituents; to apply this information for the development of new or improved products and new or improved techniques and processes, or to solve specific problems of farmers and processors.

Research to obtain the first type of information is called basic, or fundamental; research to obtain the second type is called applied. A continuing program of fundamental research is essential. Progress in applied research depends on continually refilling the reservoir of facts that flow from fundamental research. As new problems arise or as new products are visualized additional facts must almost always be gathered to solve or to develop them.

PEANUTS IN SOUTHERN AGRICULTURE:

Peanuts are one of the South's leading cash crops. Production for 1952-53 has been estimated at nearly 800 thousand tons -- a raw material value of about $160 million. Figures for 1947 show the crop marketed in these proportions: 200,000 tons kept on the farm for eating and seeding; 500,000 tons traded as peanut butter, candy, and salted peanuts; and 426,000 tons crushed for oil or exported.

The important varieties of peanuts grown in the United States are Runner, Spanish, and Virginia. Principal U. S. peanut-producing regions are: Virginia, North Carolina, and Tennessee; Southeastern area: South Carolina, Georgia, Florida, Alabama, and Mississippi; Southwestern area: Arkansas, Louisiana, Oklahoma, and Texas.

Since about 1940, about 15 to 20 percent of the crop has been crushed for oil and meal. Peanut oil is used for food in the form of margarine, shortening and cooking oils. After the oil has been separated from the rest of the kernel, the meal residue is used for feeding livestock.

Although this crop now is used primarily in food and feed uses, with little industrial utilization, peanuts offer a large potential source of chemical raw materials.

This bibliography

has been compiled and edited by

Kathryn L. Baringer

Editor, SRRL

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Literature surveys and reviews 5

At the start of a research program, one of the first steps is to determine, usually through surveys and reviews of the literature, where the gaps in information are. Scientists usually ask first: What information is already available? The starting point of their research depends on the answer.

Before the surveys and reviews of the literature listed in the following section were compiled by members of the Southern Regional Research Laboratory, a lack of catalogued information on peanuts had hindered research.

General 8

The peanut is a pea, not a nut. It belongs to the bean family. It matures its fruit, or pod, underground. At maturity, the pod, or shell, contains 1 to 3 nuts, or kernels. The shell is 20 to 30 percent of the weight of the mature peanut. The kernels contain 43 to 50 percent oil, 25 to 30 percent protein, 5 to 12 percent carbohydrates, about 3 percent crude fiber, and 2.5 percent ash.

1 Survey of the chemical composition of cotton fibers, cottonseed, peanuts, and sweetpotatoes. A literature review

1944

GUTHRIE, J. D., Hoffpauir, C. L., Steiner, E. T. and Stansbury, M. F. AIC-61. Processed. 86 pages. Revised 1949; 116 pp. Peanut section republished under the title Chemical Composition of Peanuts: A literature review, Peanut Jour. and Nut World 24(6): 26-30. 1945.

This review, including 134 references on peanuts, has a twofold purpose: To present information on the composition in a convenient and useful form, and to show where knowledge of the composition is inadequate or lacking -- so that efforts can be made in utilization research to fill the gaps, since the composition of a commodity affects its uses. References on peanuts are discussed under these subject divisions: kernel and press cake; testa (skins); shells or hulls. This survey reveals that knowledge of the composition of peanuts (as of 1944) is inadequate.

2 Peanut protein for industrial utilization. A literature survey

1949

ARTHUR, J. C., Jr. Jour. South. Res. 1(4): 6-14. 1949. Condensed version. Evaluation of Peanut Protein for Industrial Utilization: A Review: Amer. Oil Chem. Soc. Jour. 26(11): 668-671. 1949.

Reviewed are 136 references on commercial and laboratory processes for producing peanut meal, extracting and isolating protein, and producing and evaluating products made from the protein. Solvent-extracted peanut meal is a good source of protein for industrial products. Physico-chemical properties of peanut protein fractions in collodial solutions determine industrial applications. Procedures have been established by the Southern Utilization Research Branch for determining solubility of protein in different solvents; nitrogen and ash contents; color of protein dispersed in sodium hydroxide solutions; viscosity characteristics of concentrated protein solutions; and properties of specific products made from protein.

3 Abstract bibliography of the chemistry and technology of peanuts, 1830-1939

1949

MORRIS, Nelle J., and Dollear, F. G. AIC-151. Processed. 231 pp. 1949.

This is a compilation of abstracts of more than 600 references, published from 1830-1939, with references arranged under these subject divisions: (1) Peanuts--agronomy, analysis and composition, food products, nutrition, processing, protein and enzymes; (2) peanut cake--analysis, feed, nutrition, utilization; (3) peanut oil--adulteration and detection, chemical and physical properties, nutrition, processing, stability, utilization; (4) peanut shells and byproducts; (5) miscellaneous. Included are subject and author indexes. A widespread demand for copies has testified to the significance of this bibliography for all who are interested in peanut utilization.

4 List of SRRL publications and patents, 1944-1950, on cottonseed and peanut proteins and related subjects

1951

ANONYMOUS. AIC-314. Processed. 12 pp. 1951.

Of 71 publications by members of the Southern Utilization Research Branch reporting their accomplishments in research on these proteins, 49 pertain to peanut protein. Of these, 5 articles are reviews of the literature; 13 pertain to protein chemistry; 8 to processing of peanut protein; 2 to nutritional aspects; 4 to the production of peanut protein fiber; 9 to peanut protein composition; and 8 to the production of adhesives and sizes from peanut protein.

5 Prevention of oil separation in peanut butter. A review.

1952

FREEMAN, A. F., and Singleton, W. Sidney. Peanut Jour. and Nut World 31(4): 23, 30, 45-46. 1952.

The 27 references reviewed cover methods used for preventing the separation of oil in peanut butter and the history of the development of stabilization of peanut butter. Grinding roasted peanuts by various methods is discussed, especially with respect to the frictional heat imparted to peanut butter and the amount of oil freed from the cell structure of the peanut. Effect of controlling the temperature during grinding and subsequent steps in the manufacture of peanut butter in relation to oil separation is explained.

6 Peanut composition in relation to processing and utilization

1953

HOFFPAUIR, C. L., Jour. Agr. and Food Chem. 1(10): 668-671. 1953.

Information on kinds and amounts of constituents of kernels, hearts, and red skins--considered basic to research on improving the quality of peanuts in food uses--has been compiled from 67 references from the world literature on the chemical composition of peanuts, and has been discussed in relation to processing and use. Changes brought about when kernels are roasted to improve aroma, flavor, and palatability are discussed in the light of present information on the reactions taking place.

7 Research on peanuts and peanut products at the SRRL

1944

MARKLEY, K. S. Peanut Jour. and Nut World 14(1): 55, 57. 1944.

The history of the establishment of the 4 regional laboratories is traced, and the plant of SRRL is described and the following examples of its research are given: Research demonstrated that peanut oil can be hydrogenated so that part of it resembles olive oil in the properties required for use as a textile lubricant. The stability of peanut oil was improved; and data were obtained regarding thermal, dilatometric, and plastic properties of peanut oil. The influence of iodine number and temperature on the viscosity and density of refined and hydrogenated peanut oil was investigated, as a basis for use in the design of oil processing equipment. Certain methods for the analysis of peanut products were improved. The structure and composition of peanut meal and protein were investigated, and methods developed for making adhesives and a fiber from peanut protein. Peanut kernels were analyzed to determine the relation between U. S. Standards for farmers' stock peanuts and their chemical composition.

8 U.S. manufacturers of equipment for processing cottonseed and peanuts into oil, meal and byproducts

1945

ANONYMOUS. Processed. AIC-98. 8 pp. 1945. Revised 1947.

This is an alphabetical list of most of the manufacturing companies serving processors of cottonseed and peanuts. A cross listing is given under the type of equipment manufactured.

9 The role of chemistry in adapting peanuts to new uses 1947

SCOTT, W. M. Peanut Jour. and Nut World 27(1): 47-8, 90-2. 1947.

Emphasis is placed on products obtained from peanut protein, such as a wool-like fiber and several adhesive materials. Special procedures for solvent extraction of peanuts are described which result in essentially oil-free, solvent-free meal containing high-quality protein, suitable as a source for these new, useful products. Research on the properties of peanut oil is discussed, and plans to initiate research on peanut butter are mentioned. Earlier wartime research is summarized.

10 More products from peanuts 1949

ARTHUR, J. C., Jr. Mfrs. Rec. 118(10): 40-1. 1949.

Research at SRRL directed towards increasing the value of peanut oil and meal is reviewed. Pilot-plant manufacture of peanut protein and its use in making a soft, wool-like, cream-colored fiber and such adhesive products as plywood glue, rewettable glues, papercoating binders, and window shade sizes are described. Commercial development of these industrial products from peanuts will depend on commercial availability of peanut meal of certain specifications.

11 Utilization research on peanut meal and protein at the Southern Regional Research Laboratory 1951

ARTHUR, J. C., Jr. Peanut Jour. and Nut World 30(8): 21-22, 53. 1951.

This article summarizes SRRL research reported in 4 U. S. patents and 33 technical articles, which has demonstrated that peanut meal and protein have many of the properties desired for making new food and industrial products. SRRL has been the only source in this country of pilot-plant quantities of low-temperature, solvent-extracted peanut meal and protein, and has supplied samples of these products to industrial concerns and university laboratories for nutritional experiments. It is pointed out that additional fundamental information on peanut protein would be advantageous.

12 Broad aspects of research on utilization of edible peanuts

1953

FREEMAN, A. F. Peanut Jour. and Nut World 32(8): 15, 39, 40, 41, 42, 43. 1953.

Conferences held at SRRL with representatives of the peanut industry and researchers of other Federal and State agencies are described. Peanut butter industry recommended giving priority to improvement of the quality of raw peanuts and to a search for uses for hulls and for those peanuts that are undesirable for edible uses. Nut-salting and confectionery industries recommended giving priority to improvement of processes for blanching, deep-fat frying, and packaging of peanut products; and that research be conducted also on improving quality of raw peanuts.

Page

Kernels 12

Studies of the composition, properties, and reactions of peanuts illustrate how fundamental research provides a background for practical research. The determination of moisture content of peanut kernels, for example, is particularly important in determining storageability and processing characteristics. Basic studies have helped in approaching other technological problems and in the marketing of peanuts.

Storage 15

Every year, substantial damage occurs to peanuts through deterioration -- either before their use in the whole state or before processing into oil and meal. Unfavorable curing and storage conditions combined cause the material to produce heat, resulting in loss of quality and viability. The study of storage conditions is therefore important from the standpoint of moisture content, changes in chemical composition, and changes in the extracted oil and meal.

KERNELS: *See also items 20, 22, 48*

13 Analyses of peanut kernels with relation to U.S. standards for farmers' stock peanuts

1944

STANSBURY, M. F., Guthrie, J. D., and Hopper, T. H. Oil and Soap 21(8): 239-247. 1944.

Analyses of peanut kernels of Spanish, Runner, and Virginia types (1942 crop) indicated that all peanuts of U. S. No. 1, No. 2, and No. 3 farmers' stock grades grown under similar environmental conditions will yield oil and nitrogen at almost the same rate in in proportion to the total percentage of kernels after shelling; and the oil obtained from various lots of such peanuts will be of about the same quality from a refining standpoint. Reasonably small percentages of small shriveled kernels did not noticeably lower yield of oil and nitrogen, but samples composed entirely of small shriveled kernels contained only about three-fourths as much oil as did sound mature kernels. This study has resulted in trading of peanuts for oil milling on the basis of U. S. grades.

14 Determination of moisture in peanut kernels

1945

HOFFPAUIR, C. L. Oil and Soap 22(11): 283-286. 1945.

An investigation of conditions (time, temperature, and pressure) needed in oven methods of determining moisture in peanut kernels, to obtain the same values when using either whole or ground kernels and either 50-g. or 5-g. ground samples, indicated that original moisture should be determined on whole kernels and second moisture on 19-tooth or similarly ground kernels by heating for 5 hours in a forced draft oven at 130° C. Some values indicated that heating for 3 hours at that temperature may be adequate for the second moisture determination. This study provided the basis for the adoption by the American Oil Chemists' Society of the official method for the determination of moisture of peanuts and for the trading rules of the National Cottonseed Products Association for peanuts.

15 Oil and meal yields in peanut milling.

1946

DOLLEAR, F. G., Hoffpauir, C. L., and Feuge, R. O. Oil and Soap 23 (2): 45-8. 1946.

A continuous processing test was made in a commercial (hydraulic press) oil mill to determine the nature and amount of the so-called invisible oil loss which has been reported to occur in milling peanuts. Three hundred and thirty tons of farmers' stock peanuts were crushed for oil and all products entering and leaving the mill were weighed, sampled, and analyzed. The yields of oil and meal were compared with the yields predicted on the basis of chemical analysis. Under the conditions of this processing test run no so-called invisible oil loss was observed.

16 Isolation of xanthine, guanine, adenine, proteose, oxalic acid. and glutathione from peanut kernels

1950

REEVES, W. A., and Guthrie, J. D. Arch. Biochem. 26(2).: 316-318. . 1950.

Xanthine, guanine, and adenine, a proteose, and oxalic acid were isolated from the supernatant liquid remaining after the precipitation of peanut protein. X-ray diffraction data were obtained for xanthine and for the gold chloride double salts of guanine and adenine. Glutathione was isolated from an alcoholic extract of peanut kernels. None of these substances have been previously isolated from peanut kernels.

17 The tannin and related pigments in the red skins (testa) of peanut kernels

1950

STANSBURY, M. F., Field, E. T., and Guthrie, J. D. Amer. Oil Chem. Soc. Jour. 27(8). 317-321. 1950.

Red skins (testa) represent from 2.0 to 3.5 percent of peanut kernels and contain tannin and related pigments which will contribute to the presence of undesirable color in the protein preparations. An investigation showed that the tannin is a catechol-type, the purified tannin representing about 7 percent of the weight of the skins. Much smaller quantities of phlobaphene and so-called "leuco-anthocyanic chromogen" were isolated from the skins. Some evidence of traces of a flavonic-type pigment was obtained. The tannin when refluxed with alcoholic hydrochloric acid gave a water-soluble red pigment which appeared to have an oxonium-type structure. Elementary analyses and certain properties of the isolated tannin and related pigments differed considerably from those reported by previous investigators.

18 Lye-dipping for the removal of objectionable skin color from various grades of shelled Spanish peanuts

1951

POMINSKI, J., McCourtney, E. J., Stansbury, M. F. D'Aquin, Esler L., and Vix, H. L. E. Amer. Chem. Soc. Jour. 28(12): 513-516. 1951.

Experimental data have been obtained on the lipids and protein losses in the lye treatment of the various grades of shelled Spanish peanuts. It has been shown that lipid and protein losses on U. S. No. 1 shelled peanuts are lower for the cold than for the hot treatment, though both are of a low level; that these losses in the cold treatment increased with the use of lower grade shelled peanuts, U. S. No. 2 and oil mill stock; that protein solubility of kernels was negligibly affected by lye solution treatment, drying at 125° F., cold solvent extraction with hexane, air-drying, and oven-drying at 125° F.; and that damaged kernels imparted color to protein.

19 Pre-treatment of peanut kernels for effective skin removal

1952

POMINSKI, J., D'Aquin, E. L., Molaison, L. F., Vix, H. L. E., and McCourtney, E. J. Amer. Chem. Soc. Jour. 29(2): 48-51. 1952.

Best pilot-plant-scale conditions for approximately 98 percent skin removal from U. S. No. 1 shelled Spanish peanuts are: Water-treatment at room temperature, to gain not less than 20 percent moisture, drying with forced circulated air at 120° to 125° F. to approximately 4.5 percent moisture in the peanuts, and blanching in a standard split-nut blancher. Meal prepared by hexane extraction of de-skinned (98 percent), water-treated U. S. No. 1 kernels had color and flavor characteristics superior to other hexane-extracted peanut meals for food utilization. Protein prepared from this meal had a light color.

20	Storage of cottonseed and peanuts under conditions which minimize changes in chemical composition 1947	*STANSBURY, M. F., and Guthrie, J. D. Jour. Agr. Res. 75(2): 49-61. 1947.* Analysis of peanut samples stored at room temperature, 0° C., and -18° C. showed that unshelled peanuts may be stored for more than 2 years in closed cans at 1° or below without appreciable change in total nitrogen and oil contents of kernels, free fatty acid content, and iodine number of the oil.
21	Storage of cottonseed and peanuts under conditions which minimize spectrophotometric changes in the extracted oil 1948	*PONS, W. A., Jr., Murray, M. D., O'Connor, Robert T., and Guthrie, J. D. Amer. Oil Chem. Soc. Jour. 25(9): 308-13. 1948.* This work was undertaken in an effort to establish new indexes of deterioration and to further verify previous recommendations for the storage of cottonseed and peanuts. Oil extracted from peanuts stored for more than 4 years at room temperature showed a much greater absorption in the region of 227 to 234 mμ than oil from peanuts stored at 1° or at -18° C.
22	Hygroscopic equilibrium of peanuts 1949	*KARON, M. L., and Hillery, B. E. Amer. Oil Chem. Soc. Jour. 26(1): 16-19. 1949.* The hygroscopic equilibrium curve for whole peanuts--obtained over a range of 11 to 93 percent relative humidity at 25° C.--proved to be similar to that of cottonseed. All samples investigated (regardless of variety or the manner in which they were dried) exhibited very similar results. In the whole peanut, the shells contained more moisture than the kernels; however, the kernels contained a large percentage of oil, which is responsible for some of the observed differences in moisture content. In the kernel the skins contained the greatest percentage of moisture at constant relative humidity. Circulation of air over the samples and a raise in temperature to 35° greatly increased the rate at which hygroscopic equilibrium was attained.

SRRL has developed processes of direct solvent extraction of peanuts that produce almost oil-free meal and give a higher yield of oil than is possible with hydraulic and and screw-press processes. But commercial solvent extraction in the United States is so far confined, it is believed, to the use of the prepress solvent-extraction method; direct solvent extraction is not now being used, as far as is known. However, many of the data reported in SRRL publications, dealing with problems in material preparation and extraction, are pertinent to prepress-solvent extraction methods. For example, the data on recovery of solvent from peanut products during processing are being used with present methods. In addition, the data reported apply in the use of SRRL's newly developed filtration-extraction method for oilseeds, which can be used as a direct process for the solvent extraction of peanuts.

Early production statistics. In 1863 the U. S. produced about 10,000 tons of peanuts. During the 1920's production averaged 395,000 tons annually, with a farm value of about 39 million dollars. During the 1930's and again during the war years, production increased sharply. From 1942-1951, average annual production was more than a million tons, with a farm value of almost 200 million dollars.

SOLVENT EXTRACTION · *See also items 18, 19*

23 Solvent extraction of cottonseed and peanut oils. Boiling point-vapor pressure-composition relations for miscellas of oils in hexane.

POLLARD, E. F., Vix, H. L. E., and Gastrock, E. A. Indus. and Engin. Chem. 37(10): 1022-1026. 1945.

Boiling points and densities of mixtures of cottonseed and peanut oils with commercial hexane are useful in the design of vacuum evaporators and strippers and for control operations involving temperature, time of heating, and concentration of oil-solvent mixtures of various compositions, to prevent or minimize fixation of objectionable coloring matter or other deteriorative heat effects. Boiling-point data are determined at various concentrations of crude cottonseed oil and crude peanut oil, over a range of pressures from 160 to 760 mm. absolute in commercial hexane. The effect of agitation in establishing equilibrium conditions of the oil-solvent mixtutes is noted.

1945

24 Solvent extraction of cottonseed and peanut oils. IV. Pilot plant batch extractions.

POMINSKI, J., Molaison, L. J., Crovetto, A. J., D'Aquin, E. L., Westbrook, R. D., and Guilbeau, W. F. Oil Mill Gazetteer 51(12): 33-39. 1947.

Experience gained in batch solvent extraction of cottonseed and peanuts is reported. The portable batch solvent extraction plant and apparatus used are described and illustrated, and typical extraction data obtained are tabulated. Batch extraction has been found indispensable for preparing relatively large batches of oils and of defatted cottonseed and peanuts and other oilseeds for use in pilot-plant work and in chemical, nutritional, protein, and other investigations. The plant has proved a valuable tool for obtaining pertinent processing and development data, including information on equipment and operating methods.

1947

25 Diffusion phenomena in solvent extraction of peanut oil.

FAN, H. P., Morris, J. C., and Wakeham, H. Indus. and Engin. Chem. 40(2): 195-199. 1948.

Theory of diffusion extraction of oil from a porous solid is examined in the light of previous investigations on solvent extraction of oilseeds. Peanut kernels were prepared and extracted in such a manner as to meet the conditions required by Fick's law. The diffusion coefficient under these conditions varies

1948

with solvent and with the moisture content of the oilseeds, but is essentially independent of the thickness of the peanut sections extracted. Results with peanut sections follow theory closely when the broken cells at the surfaces and the void spaces due to moisture loss are considered. Techniques and conclusions presented may help in studying extraction from other oilseed systems.

26 Continuous solvent extraction of cottonseed and peanuts at the Southern Regional Research Laboratory

1948

GASTROCK, E. A., and D'Aquin, E. L. Oil Mill Gazetteer 55(4): 13-21. 1948.

The Southern Laboratory's pilot plant equipment for studying continuous solvent extraction of oilseeds is described, and the course of the solvent and meal in the process is followed diagrammatically. Various difficulties encountered before relatively smooth operation of the plant was achieved are enumerated, along with the steps taken to overcome them. In the later runs, both cottonseed and peanut flakes were extracted to a content of 1 percent, or less, of residual oil. Methods are given for the preparation for extraction of both cottonseed and peanut flakes.

27 Boiling points of cottonseed and peanut oil miscellas in English units

1950

DECOSSAS, K. M., Mackey, H. A., and Houghan, G. F. AIC-257, 2 pp., illus. Processed. 1950.

Data in the literature on boiling point-vapor pressure-constant composition parameters for crude cottonseed oil-commercial hexane miscellas and crude peanut oil-commercial hexane miscellas have been plotted in inches of mercury vacuum and in degrees of temperature Fahrenheit to make them more useful and suitable for design calculations, plant operations, and interpretations of operating data. Constant composition parameters are at 0, 50, 60, 70, 80, 85, 90, 93, 95, 97, and 98 percent oil by weight.

28 Densities and gravities of cottonseed and peanut oil miscellas in English units

1950

DECOSSAS, K. M., Deckbar, F. A., Jr., and Hecker, J. L. AIC-292. Processed 2 pp., illus. 1950.

Data in the literature on density-temperature-constant composition parameters for refined and winterized peanut oil-commercial hexane miscellas are replotted in English units; namely, densities in pounds per cubic foot and per gallon, and temperatures in degrees Fahrenheit. The specific gravities are calculated on a basis of the density of water at 60° F. These plots complement those in English units on boiling points of cottonseed and peanut oil miscellas. Replotting these data will render them more useful and suitable for design calculations, plant operations, and interpretations of operating data.

29 Viscosities of cottonseed and peanut oil-hexane miscellas in English units.

1951

DECOSSAS, K. M., Deckbar, F. A., Jr., and Hecker, J. L. AIC-304. Processed. 2 pp., illus. 1951.

Constant composition curves of viscosity versus temperature for refined and winterized peanut oil-commercial hexane miscellas are included. Tables of viscosities of miscellas at various temperatures and compositions were converted from data in metric units to English units and plotted as intermediate viscosity-composition isotherms. Readings of viscosity versus temperature taken off these intermediate curves were plotted. Absolute viscosity, as ordinate expressed in pounds per foot-hour, and temperature, t, as abscissa expressed in degrees Fahrenheit, were plotted. These graphs are complementary to others in English units on boiling points, densities, and gravities of oil miscellas.

30 Flake feeding device for solvent extraction of oil-bearing materials

1952

GARDNER, H. K., D'Aquin, E. L., Parker, J. S., and Gastrock, E. A. Indus. and Engin. Chem. 44(9): 2261-2264. 1952.

The device was developed to feed flaked oil-bearing materials to a pilot-plant size solvent extractor: To provide a continuous, uniform discharge of the material which can be varied over a 2.5 to 1 range; to form a positive seal plug to prevent the escape of solvent vapors at the point of entry of the material; and to cause a minimum breakage of the material into very small particles. The device operated satisfactorily with flakes from cottonseed, peanuts, okra seed, and rice bran, and is of a type suitable for feeding a wide variety of materials other than oilseed flakes or meats. Scaling up to commercial size should be feasible.

31 Solvent extraction of cottonseed and peanut oils. IX. Determination of fines in miscella

1952

GRACI, A. V., Jr., Crovetto, A. J., Parker, J. S., and Reuther, C. G., Jr. Amer. Oil Chem. Soc. Jour. 29(2): 71-73. 1952.

Cottonseed, peanuts, okraseed, and rice bran were used in experiments in which was developed a rapid method of determining the solids content of oil-solvent miscellas. The method is volumetric and replaces the slower gravimetric method. The volumetric determination is converted to weight values by the use of an appropriate curve. The construction of the curve and its application in pilot-plant operations are described.

Page

Oil 22

Peanut oil is suitable for many uses similar to those of cottonseed and soybean oils, if enough fundamental information can be obtained for the development of suitable commercial processes. Studies at SRRL have had the objective of providing vegetable oil processors with extensive information on the properties and modification of peanut oil, to enable this oil to be incorporated with other vegetable oil in shortening and margarine oils. Another example of information that has been obtained: studies of solvent winterization as a foundation for the development of a commercial process for preparation of a salad oil from peanut oil

Meal 29

Numerous uses for peanut meal and separated protein are possible; but industrial utilization depends on a knowledge of the nature and properties of peanut meal and on the development of methods for modifying these properties to meet the requirements for particular uses. A number of SRRL publications report investigations in which such information has been obtained or in which it has been demonstrated that peanut meal can be used in making new industrial products and as a source of protein for new products.

Protein 32

Peanut protein is significant in determining the food value of peanuts. Also, it has potentialities for industrial uses, similar to those of casein and soybean proteins. In investigations at SRRL special processes have been developed -- founded on studies of the composition and properties of peanut protein -- for preparing peanut protein suitable for use in making such products as a synthetic fiber, adhesives, and paper and textile sizes. And whenever economics permit, it will be possible, with very little additional work, to consider seriously the possibility of making industrial use of peanut protein.

Hulls. 41

32 Variables affecting the yield of normal oleic acid produced by the catalytic hydrogenation of cottonseed and peanut oils

1942

BAILEY, A. E., Feuge, R. O., and Smith, B. A. Oil and Soap 19(10): 169-176. 1942.

Peanut oil is one of a large group of industrially important fats and oils that contain glycerides of oleic and linoleic acids and only negligible quantities of other unsaturated acids. To establish the conditions to be used in research for the laboratory hydrogenation of cottonseed and peanut oils to obtain the greatest yield of normal oleic acid and the least loss of potential oleic acid, these variables were investigated: temperature, concentration of catalyst, hydrogen pressure, and degree of agitation and nature of the nickel catalyst. Increasing the temperature, increasing the catalyst, decreasing the pressure, and decreasing the agitation of the catalyst favored the formation of iso-oleic acid, simultaneously repressing the formation of stearic acid. The nature of the nickel catalyst may affect the composition of the hydrogenated oil. Peanut oil is a more suitable raw material than cottonseed oil for the production of normal oleic acid because of its initially greater content of this acid and its lesser content of linoleic acid.

33 Possibilities of peanut, pecan and safflowerseed oils as supplements for olive oil

1943

BICKFORD, W. G., Mann, G. E., and Markley, K. S. Oil and Soap 20(5): 85-89. 1943.

As part of research to develop a suitable substitute for olive oil, especially for use in the textile industry, the chemical and physical characteristics of these oils were investigated and compared with those of olive oil to learn whether any of these oils simulated olive oil in composition. Although the composition of a commercial, completely refined peanut oil did not resemble that of a commercial brand of imported olive oil, the peanut oil appeared capable of modification to form a product chemically similar to olive oil, and for certain purposes it could replace olive oil without modification.

34 Evaluation of the modified Renard and Kerr tests for the determination of peanut oil

1943

VOORHIES, S. T., and Bauer, S. T. Oil and Soap 20(9): 175-178. 1943.

In connection with cooperative work of the Fat Analysis Committee of the American Oil Chemists' Society, SRRL investigated the applicability of the Renard test, as modified by the Association of Official Agricultural Chemists, and the applicability of the Thomas and Yu modification of the magnesium-soap alcohol method of Kerr for the determination of peanut oil in admixtures with various other oils. The best results were obtained in analyses of mixtures of peanut-soybean oil, by the modified A. O. A. C. method, but neither method appeared to be sufficiently accurate to warrant its use for the quantitative determination of peanut oil in vegetable oil mixtures.

35 Antioxygenic properties of molecularly distilled fractions of peanut oil

1943

BAILEY, A. F., Oliver, G. D., Singleton, W. S. and Fisher, G. S. Oil and Soap 20(12): 251-255. 1943.

Through investigation of a refined peanut oil and the same oil hydrogenated to the degree to which hydrogenation is usually carried in the manufacture of commercial edible fat products, information was obtained on the extent to which the antioxidants of peanut oil can be separated by molecular distillation; on the stability of the oil at varying levels of antioxidant concentration; and the identity of the antioxidants.

36 Molecularly distilled peanut oil antioxidants and pure alpha-tocopherol as stabilizing agents for fats of poor keeping quality

1944

OLIVER, G. D., Singleton, W. S., and Bailey, A. E. Oil and Soap 21(7): 188-193. 1944.

Peanut oil, although not one of the richer sources of tocopherol, becomes extremely stable upon hydrogenation. Molecularly distilled concentrates of peanut oil antioxidants and pure alpha-tocopherol were tested as stabilizers of lard and of abnormal peanut oil products of poor stability. Neither the peanut oil concentrates nor alpha-tocopherol was effective in improving the stability of the abnormal peanut oils, indicating that poor keeping quality, when encountered, is not generally due simply to a

and potentially is important in producing mono- and diglycerides of unsaturated acids, and presents possibilities in the field of "tailor-made" fats. In this article, data are presented to show the actual rate of alcoholysis and how it is affected by the concentration of catalyst and alcohol, as well as the rate of catalyst disappearance through saponification. The formation of mono- and diglycerides during the course of alcoholysis and the mechanism of the reaction are discussed in terms of the composition of the reaction product.

40 Modification of vegetable oils. VIII. Conversion of monoesters of peanut oil fatty acids to triglycerides

1949

GROS, Audrey T., and Feuge, R. O. Amer. Oil Chem. Soc. Jour. 26(12): 704-709. 1949.

Conversion of the methyl and ethyl esters of peanut oil fatty acids into triglycerides through alcoholysis and ester-ester interchange reactions was investigated to establish the conditions for the most rapid and complete transformation. The most effective catalysts for alcoholysis were barium hydroxide, lithium hydroxide, sodium ethylate, and sodium hydroxide. When equivalent quantities of monoesters were allowed to interact, the initial rate of alcoholysis was influenced markedly by the temperature and concentration of catalyst and to some extent by the pressure. Monoesters were converted fairly completely into triglycerides by reacting with an excess of glycerol and then decomposing the resulting glycerides by heating and stripping with steam under low pressure. Ester-ester interchange reactions using triacetin and methyl or ethyl esters did not proceed as well as has been reported in the literature.

41 Thermal properties of fats and oils. VII. Hydrogenated and unhydrogenated peanut oils

1950

WARD, T. L., and Singleton, W. S. Amer. Oil Chem. Soc. Jour 27(11): 423-426. 1950.

It is believed that this investigation is the first reported on the heat capacity of peanut oils. A refined and bleached peanut oil was examined calorimetrically before and after hydrogenation. Measurements were made over the entire range of melting. Values for specific heats were used to develop equations relating temperature and specific heat of the oils in both solid and liquid states. The heat of fusion of both samples was also determined. The relative amounts of solid and liquid glycerides in hydrogenated and unhydrogenated peanut oil at various temperatures over their entire melting ranges were estimated from the calorimetric data.

42 Phase relations pertaining to the solvent winterization of cottonseed and peanut oils in acetone

1950

SKAU, E. L., Burleigh, E. G., Bancwetz, L. F., and Dopp, W. N. Amer. Oil Chem. Soc. Jour. 27(12): 556-564. 1950.

Systematic physical-chemical data on the solvent-winterization behavior of cottonseed and peanut oils with acetone have been obtained which should serve as a basis for selecting the conditions necessary for the effective solvent winterization of these oils in acetone. The two oils are only partly miscible with acetone below certain temperatures which have been determined. In peanut oil this phenomenon may interfere with the winterization process within a certain range of concentrations. It seems probable that if acetone were used as the winterization solvent for peanut oil, the separation into two liquid layers and the sensitivity of this phenomenon to moisture might be a source of processing difficulties especially if filtration instead of centrifugation were used to separate the solid from the supernatant.

43 Phase relations pertaining to the solvent winterization of peanut oil in acetone-hexane mixtures

1951

BOUCHER, R. E., and Skau, E. L. Amer. Oil Chem. Soc. Jour. 28(12): 501-504. 1951.

Systematic phase relation data have been obtained on the solvent-winterization behavior of a refined peanut oil in a mixed solvent consisting of 85 percent by weight of acetone and 15 percent of hexane. Graphs are given which show the effect of oil-solvent ratio, chilling temperature, holding-time, and agitation on the percentage of solid removed, the degree of winterization, and the settling qualities of the solid separating. The data afford a preliminary basis for pilot-plant design, selection of optimum conditions, and recognition of limitations for pilot-plant research on the solvent winterization of peanut oil.

44 Stability of cottonseed and peanut oils to autoxidation

1952

DOLLEAR, F. G. Potato Chipper 11(11): 24, 26, 28, 30, 32. 1952.

In a study of the influence of the type and proportion of the various fatty acid components of the glycerides and the presence of natural or added antioxidants, of pro-oxidants, and of synergists and/or metal deactivators on the resistance of cottonseed and peanut oils to autoxidation, it was found that the stability of these oils can be increased by hydrogenation or by the addition of some types of antioxidants.

45 Stability tube with foam breaker

1952

FISHER, G. S., and Morris, N. J. Analyt. Chem. 24(8): 1384. 1952.

An all-glass stability tube is described which was developed to control excessive foaming during application of the active-oxygen method for the determination of the stability of oils extracted from peanut butter and peanuts. The tube has been used for approximately 2 years satisfactorily.

46 Phase relations in the solvent winterization of molecularly rearranged peanut oil and cottonseed oil

1952

BOUCHER, R. E., and Skau, E. L. Amer. Oil Chem. Soc. Jour. 29(9): 382-385. 1952.

Systematic phase-relation data, obtained to determine the effect of either mild or extensive molecular rearrangement on the winterization behavior of peanut or cottonseed oils, show that if the molecular rearrangement step is introduced before solvent winterization, larger percentages of solid must be removed to obtain a winterized oil, especially for cottonseed oil; lower yields result; lower chilling temperatures and longer chilling periods are required, partly because of a lower rate of crystallization; and the settling qualities of the solid separating are markedly impaired.

47 Determination of stabilities of crude peanut oils by accelerated aeration methods

1953

MORRIS, N. J., and Freeman, A. F. Food Tech. 7(6): 227-228. 1953.

Stabilities of crude peanut oils determined at 110° C. by Mehlenbacher's modification of the active oxygen method (A.O.M.) are compared with those determined by the active oxygen method at 97.8° C. The determination at 110° C. provides a suitable objective method for the determination of stability of crude peanut oils in 40 percent of the time required by use of the active oxygen method at 97.8° C.

48 Factors affecting the stability of crude oils of sixteen varieties of peanuts

1953

FORE, S. P., Morris, N. J., Mack, C. H., Freeman, A. F., and Bickford, W. G. Amer. Oil Chem. Soc. Jour. 30(7): 298-301. 1953.

No information heretofore has been published in which composition and stability have been determined simultaneously for crude oils from known varieties of peanuts for the purpose of relating stability to composition. In the present work the relations between fatty acid compositions, tocopherol contents, and autoxidative stabilities of 16 crude oils from different varieties of peanuts have been investigated. The relative linoleic acid content is a major factor affecting variations in stabilities. With the exception of the oils from Runner peanuts tocopherol compositions of the oils did not vary significantly, either in the nature and distribution of individual tocopherols, or in total tocopherol contents. The enhanced stability of the oils from the Runner peanuts may be due in part to their higher tocopherol contents. There is some evidence that crude peanut oils contain some nontocopherol antioxidant and/or synergist.

49 Commercial peanut meal; peptization and extraction of nitrogenous constituents and the color comparison of protein solutions

1944

BURNETT, R. S., and Fontaine, T. D., Indus. and Engin. Chem. 36(3): 284-288. 1944.

Industrial utilization of peanut meal and the separated protein depends on a knowledge of the properties of the nitrogenous and other constituents of peanut meal as a prerequisite to the development of methods of modifying these properties to meet the requirements for particular uses. In this article data are presented to show that the nitrogen peptization values for peanut meals can be used as a practical guide in determining the amount of protein which can be separated from a meal. The relative spectral transmittances of peanut preparation in sodium hydroxide solution indicate that proteins of satisfactory color can be obtained from blanched, red-skinned peanuts and from unblanched, white-skinned peanuts. The practicability of using white-skinned varieties for industry uses is discussed.

50 Properties of peanut meal; influence of processing factors

1944

FONTAINE, T. D., Samuels, C. S., and Irving, G. W. Indus. and Engin. Chem. 36(7): 625-627. 1944.

Specific information of interest to peanut processors is presented on the proper processing conditions under which sufficient oil can be removed with the least alteration in the meal proteins. Data are presented on the effects of temperature, humidity, and length of processing treatment on the peptizability of the nitrogenous constituents of solvent-extracted peanut meal and of flaked raw peanuts. The critical denaturation temperature for peanut protein in the meal, as measured by peptization, lies above 118° C. (dry heat) and above 80° relative humidity.

51 Peanut-meal plywood glue

1946

BURNETT, R. S., and Parker, E. D. Trans. Amer. Soc. Mech. Engin. 68(October): 751-756. 1946.

Specifications have been established for a peanut meal suitable for use in preparing plywood glue; a satisfactory glue formula has been developed; and information has been obtained concerning the behavior of the glue under varying conditions. Maximum cooking temperatures of 210° to 215° F. for 76 to 80 minutes produced a suitable meal in experiments; but each mill has to determine its own most favorable conditions of time and temperature for preparing the specified meal. The dry and wet plywood shear test, the block shear test, and the measurement of viscosity show that peanut meal glue of the formula given meets requirements established for casein and casein-type glues. A plant-scale formula with details for preparing the glue mixture is given.

52 The nutritive value of peanut cake, meal, protein and nonprotein residue for chicks

1948

ALTSCHUL, A. M., Irving, G. W., Jr., Guilbeau, W. F., and Schaefer, H. C. Poultry Sci. 27(4): 402-407. 1948.

The nutritive value of peanut meals, isolated protein fractions and protein meal residues obtained by various processing methods was investigated in comparison with soybean and cottonseed meals as the supplement in chick starting diets. The feeding experiments are described in detail, and the results tabulated. Used as about one-fourth of the protein supplement in an otherwise adequate diet, peanut meals supported chick growth as well as commercial screw-pressed soybean meal, and were only slightly inferior to commercial hydraulic-pressed cottonseed meal. Solvent-extracted peanut meal had the same nutritional value as hydraulic-pressed peanut meal. Peanut protein preparations produced gains in weight similar to those obtained by feeding the original peanut meals. The residue remaining after extraction of protein from solvent-extracted peanut meal supported growth, but had less nutritional efficiency, expressed as the amount of feed required to produce a unit gain in weight, than either peanut meal or isolated peanut protein.

53 Electrophoretic analysis of peanut and cottonseed meals and proteins

1950

KARON, M. L., Adams, M. E., and Altschul, A. M. Jour. Phys. and Colloid Chem. 54(1): 56-66. 1950.

Cottonseed and peanut meals and the derived proteins were analyzed by means of the Tiselius electrophoresis apparatus. The effects of method of extraction of the protein and of the buffer and pH of the buffer solutions were investigated. By fractional precipitation involving a change of ionic strength, the two major components of cottonseed protein can be concentrated to above 80 percent purity. Approximately 75 percent of peanut protein consists of two components. These migrate as a single entity, unless the meal has been pre-washed to remove soluble sugars and phytin, in which case the two major components separate into two almost equal fractions.

54 Cottonseed and peanut meal glues: permanence of plywood glue joints as determined by interior and exterior accelerated cyclic service tests

1951

HOGAN, J. T., and Arthur, J. C., Jr. Amer. Oil Chem. Soc. Jour. 28(6): 272-274. 1951.

Data on the strength properties of cottonseed and peanut meal glues in plywood bonds as they are affected by accelerated interior and exterior cyclic service tests show that cottonseed meal glue is superior to peanut meal glue; (compares favorably with commercial casein glue on an interior test basis for 5 cycles).

55 Cottonseed and peanut meal glues. Resistance of plywood bonds to chemical reagents

1952

HOGAN, J. T., and Arthur, J. C., Jr. Amer. Oil Chem. Soc. Jour. 29(1): 16-18. 1952.

The resistance of birch plywood glue bonds using cottonseed and peanut meal or casein to organic and inorganic reagents for periods ranging from 1 to 14 days was determined. It was suggested that the principal attractive forces involved in the protein bonds were ionic or valence forces and that differences observed in the resistance of the glues to the chemical reagents were probably due to variations in the amino acid constitution of the proteins.

56 Estimation of skin content of peanut meals and relative skin pigment content of isolated proteins

1952

STANSBURY, M. F., and Hoffpauir, C. L. Amer. Oil Chem. Soc. Jour. 29(9): 370-372. 1952.

The method described is based on the fact that the pigments consist predominantly of a catechol tannin and related compounds. It may be used to estimate the degree of skin removal in preparing meals and evaluating proteins for skin pigment content.

57 Viscosity patterns of peanut protein solutions: Comparison with other vegetable proteins and with casein

1945

BURNETT, R. S., Roberts, E. J., and Parker, E. D. Indus. and Engin. Chem. 37(3): 276-281. 1945.

Data are presented showing the influence on viscosity of peanut-protein solutions, made alkaline with sodium hydroxide, of concentration, heat, time, pH, and other factors, in turn affected by the methods employed in the preparation of the peanut meal and the separation and subsequent treatment of the protein. Viscosity behavior of solutions of peanut protein is compared with that of soybean and cottonseed proteins.

58 Peanut protein hydrates. Preparation and properties

1945

BURNETT, R. S. Indus. and Engin. Chem. 37(9): 861-864. 1945.

Peanut protein hydrates, capable of binding increasing amounts of water, from 38 to about 70% by weight of the sol, as the pH value of the system is increased from 4.5 to 9.0, are tacky, and at pH values near neutrality have characteristics making them suitable for use as adhesives, provided the protein used is isolated from the meal with a minimum of alteration by heat or alkali.

59 Peanut protein hydrates. Utilization as tacky and remoistening adhesives

1945

BURNETT, R. S., Parker, E. D., and Roberts, E. J Indus. and Engin. Chem. 37(10): 980-982. 1945.

Glues have been prepared from peanut protein isolated from solvent-extracted or hydraulic-pressed peanut meals, whose rewettability, tackiness, and flow properties make them suitable for purposes for which vegetable proteins have previously been considered unsuitable. Readily soluble glues can be prepared from isoelectric peanut protein curds by neutralizing the curds before they are dried. Dewatering curds to the amount of water in the hydrate reduces drying costs and provides a glue of relatively uniform ash content.

60 Electrophoretic investigation of peanut proteins. II. Composition of several peanut protein fractions

1945

FONTAINE, T. D., Irving, G. W., Jr., and Warner, R. C. Arch. Biochem. 8(2): 239-249. 1945.

Electrophoretic analyses are presented of the protein preparations obtained by precipitation from peanut meal extracts at pH 4.5; of the small amount of the protein fraction remaining in the mother-liquor; and of the fractions obtained by precipitation from peanut meal extracts. Electrophoretic composition and physical properties and the high yields of these fractions which can be obtained, suggest the applicability of certain fractions in food products or in the preparation of adhesives and fibers.

61 Improvement in the color of peanut and cottonseed proteins

1945

FONTAINE, T. D., Detwiler, S. B., Jr., and Irving, G. W., Jr. Indus. and Engin. Chem. 37(12): 1232-1236. 1945.

Protein preparations as light or lighter in color than commercial samples of soybean protein can be obtained from the meals of white-skinned and blanched, red-skinned peanuts, without the use of bleaching agents. The color of proteins prepared from meals of unblanched red-skinned peanuts is improved through controlled protein extraction and precipitation techniques and by washing precipitates with organic solvents such as dioxane, acetone, and methyl ethyl ketone.

62 Purification and properties of arachain, a newly discovered proteolytic enzyme of the peanut

1945

IRVING, G. W., Jr., and Fontaine, T. D. Arch. Biochem. 6(2): 351-364. 1945.

Purified solutions of arachain were prepared that are about 20 times more potent than those of peanut meal. Arachain is present in cotyledons and germs, but not in the skin. Common substances employed to activate most enzymes had no effect on the hydrolytic action of arachain on benzoyl-l-arginino amide.

63 Electrophoretic investigation of peanut proteins I. Peanut meal extract, arachin and conarachin

1945

IRVING, G. W., Jr., Fontaine, T. D., and Warner, R. C. Arch. Biochem. 7(3): 475-489. 1945.

The homogeneity of peanut proteins and of arachin and conarachin was studied electrophoretically. Peanuts contain 2 major protein components in an approximately 7:1 ratio, totalling 87 percent of the protein content, and two minor components in equal amounts. Arachin, comprising 63 percent of the protein, consists of both major components; conarachin, 33 percent, contains 80 percent of the major component and 20 percent minor components.

64 Food yeast growth of peanut protein waste liquors

1945

KLATT, T. J., Parker, E. D., Pomes, A. F., and Porges, N. Oil and Soap 22(1): 319-321. 1945.

Peanut protein waste liquor supplemented only with an ammonium salt was an excellent medium for the propagation of the food yeasts, Torulopsis utilis, in batch and continuous processes. With nitrogen to give a carbon nitrogen ratio of 8:1, 100 grams of sugar yielded 48 grams of a high-protein yeast that was comparable in food value and vitamin content to food yeasts from other sources.

65 Manufacture and use of peanut protein

1946

BURNETT, R. S. Chem. Engin. News 24(4): 478-480: 1946.

The preparation of peanut protein, useful in making adhesives and fibers, by alkali extraction of solvent-extracted or hydraulic-pressed peanut meal is described. To obtain satisfactory color in the extracted protein, either white-skinned peanuts must be used or, before processing the kernels for oil and meal, the red color may be removed from the skins. A flow sheet is given and processing costs are estimated.

66 Peptization of peanut and cottonseed proteins. Effect of dialysis and various acids

1946

FONTAINE, T. D., Irving, G. W., and Markley, K. S. Indus. and Engin. Chem. 38(6): 658-662. 1946.

While the shapes of the pH- peptization curves for cottonseed and peanut meals differ, the response of their proteins to the removal of dialyzable meal constituents is the same, showing that naturally occurring substances present decrease markedly the peptizability of the meal nitrogen at certain acid pH values but exerts no effect at alkaline pH values.

67 Protein-phytic acid relationship in peanuts and cottonseed

1946

FONTAINE, T. D., Pons, W. A., Jr., and Irving, G. W., Jr. Jour. Biol. Chem. 164(2): 487-507. 1946.

The protein-phytic acid solubility relation over a wide pH range has been determined for peanut and cottonseed meals and for the dialyzed meals and isolated proteins, and the theoretical and practical significance of the acid relation is discussed. Some comparative data on soybean meal are included. A few characteristics of the phytase present in the meals are described. The data establish that the naturally occurring phytic acid in seed meals is responsible for the suppression of the solubility of the seed meal proteins at pH values below their isoelectric points.

68 Process of recovering peanut protein

1946

IRVING, G. W., Jr., Merrifield, A. L., Burnett, R. S., and Parker, E. D. U. S. Patent No. 2,405,830. August 13, 1946.

Different protein fractions can be produced from peanut meal by adjusting the pH of an aqueous extract of proteins obtained from substantially oil-free peanut meal to specific values in succession and removing the protein fractions thus precipitated at each pH value. Proteins are obtained which have widely different physical and chemical characteristics and are suitable for a variety of uses in adhesives, sizes, paper coatings, cold water paints, films, and fibers.

69 Fiber from peanut protein. I. The production and properties of Sarelon

1946

MERRIFIELD, A. L., and Pomes, A. F. Textile Res. Jour. 16(8): 369-377 1946.

A fiber (Sarelon) is described which has been spun from peanut protein by a "wet" process in a manner similar to that employed for viscose rayon production. A specially designed apparatus which permits the spun fiber to be stretched and strengthened and the general methods of manufacture are described. Sarelon is light cream-colored in its natural state, has a soft hand and a warmth similar to that of wool, and an affinity for dyes normally used on protein fibers and may be dyed with vat and direct cotton dyes. When dibutyl tartrate, diglycol laurate, and oil were employed in the protein spinning solution and when the resulting fiber was after-treated in a solution of sodium chloride, hydrochloric acid, and formaldehyde, the fiber had a dry strength of 0.67 gram per denier, a wet strength of 0.18 gram per denier, and dry and wet elongations of 11.8 and 22.0 percent, respectively.

70 Vegetable protein hydrates

1947

BURNETT, R. S., and Roberts, E. J. U. S. Patent No. 2,421,113. May 27, 1947.

A process for preparing fluid, comparatively stable, and relatively clear vegetable protein hydrates consists of forming a mixture of water and protein, the quantity of water being about 50 percent of the hydrate, which has a pH of about 7.0.

71 Ethanol-extractable nonprotein material in preparations of peanut protein

1947

HOFFPAUIR, C. L., and Guthrie, J. D. Amer. Oil Chem. Soc. Jour. 24(11): 393-397. 1947.

Steps in the preparation of protein from solvent-extracted peanut meal and the nature and amounts of nonprotein constituents extracted by cold ethanol at the curd stage are discussed. Moisture, ash, nitrogen, phosphorus, and lipids contents of original meal samples, meal residues, and the air-dried and alcohol-washed proteins are reported.

72 Peanut protein fiber: its position in the protein fiber world

1947

SCOTT, W. M. Chemurgic Digest 6(12): 192-195. 1947.

The status of various protein-based synthetic fibers is surveyed. Production of the peanut protein fiber "Sarelon" at the SRRL and economic and technological aspects of the production of synthetic protein fibers are discussed. The major problem in utilizing certain oilseeds is obtaining a meal of satisfactory quality in commercial quantities.

73 Peanut protein paper coatings

1948

ARTHUR, J. C., Mason, T. W., Jr., and Adams, Mabelle E. Amer. Oil Chem. Soc. Jour. 25(9): 338-340. 1948.

Paper when coated with peanut protein adhesive and mineral pigments gave high wax pick tests. Using neutralized protein as the adhesive, coating slips containing 40 percent solids were prepared with pH values as low as 6.3; and when these slips were applied to raw stock, the coating had wax pick values satisfactory for many printing operations. Over a pH range of 8 to 12, coatings prepared from unwashed protein gave high wax pick values; those prepared with water-washed protein, slightly lower values.

74 Pilot-plant manufacture of peanut protein

1948

ARTHUR, J. C., Jr., Crovetto, A. J., Molaison, L. J., Guilbeau, W. F., and Altschul, A. M. Amer. Oil Chem. Soc. Jour. 25(11): 398-400. 1948.

An improved, simplified process for producing higher yields of protein from solvent-extracted peanut meal is described. As the rate of addition of sulfur dioxide was increased, and the temperature of the extract liquor decreased, density and settling rate of the protein curd increased. Spray washing of the extracted meal was more efficient than the dilution method of washing, and increased yield of protein.

75 Peanut protein for window shade sizes

1949

ARTHUR, J. C., Jr., and Cheng. F. W. Amer. Dyestuff Rptr. 38(14): 535-537. 1949.

Experiments indicate the suitability of peanut protein for use as a sizing material in window shade manufacture and in similar applications. In the laboratory, cotton muslin sized with peanut protein solutions showed tensile and flexibility characteristics similar to those of samples sized commercially with animal glues. Peanut protein also is satisfactory for many other adhesive uses. The cost of isolating and processing peanut protein compares favorably with the cost of producing other industrial proteins, and the potential supply is large.

76 Preparation of peanut protein free from peanut skin pigments

1949

BURNETT, R. S U. S. Patent No. 2,463,740. (March 8, 1949).

Shelled, unskinned kernels are exposed for a few seconds to a dilute aqueous alkaline solution to remove pigment from the skins, then are washed, partly dried, and separated into oil and light-colored meal, from which a high-quality protein may be obtained. Also described is similar removal of soluble pigments in kernels by a few seconds' exposure to dilute acid.

77 Peanut protein fibers -- pilot-scale plant

1950

ARTHUR, J. C., Jr., and Many, H. C. Amer. Dyestuff Rptr. 39(22): 719-722. 1950.

The construction and operation of a pilot-scale fiber-spinning plant are described and typical operating data for the plant are presented.

78 Peanut protein for industrial use

1951

ARTHUR, J. C., Jr. Yearbook of Agr., 1950-1951. pp. 611-614. U. S. Dept. of Agr.

Research directed toward increasing the value of the meal and protein from peanuts, with the principal aim of developing industrial products, is discussed. A typical process for separating protein from solvent-extracted peanut meal is described. Several products produced from the peanut meal and protein are described.

79 Processing variables in peanut protein preparation

1951

POMINSKI, J., Laborde, E. J., Cirino, V. O., and Vix, H. L. E. Amer. Oil Chem. Soc. Jour. 28(12): 508-512. 1951.

A general equation was derived by which yield of protein may be calculated for a solvent-extracted peanut meal at various water-meal ratios. Experiments showed that nitrogen solubility for ground and unground meal increased slowly with temperature but was little affected by the water-meal ratio, and that peptization might be considered complete in 30 minutes. For unground meal yield of protein increased with increase in water-meal ratio. Repeated peptizations and grinding of meal led to increased protein yields.

80 Peanut protein fibers - flow characteristics of spinning solutions affected by rate of extrusion

1952

ARTHUR, J. C., Jr., and Many, H. G. Amer. Dyestuff Rptr. 41(13): 385-386. 1952.

In the preparation of peanut protein fiber the loss in head in a section of the extrusion system per unit volume of spinning solution delivered decreased with increasing rate of extrusion, indicating that the fluidity of spinning solutions is affected by rate of extrusion. An optimum rate of extrusion was determined for each extrusion system to minimize the loss in energy in the system per unit volume delivered.

81 Production of peanut protein

1952

POMINSKI, J., Gordon, W. O., McCourtney, E. J., Vix, H. L. E., and Gastrock, E. A. Indus. and Engin. Chem. 44(4): 925-928. 1952.

Pilot-plant yields of protein were increased by successive peptizations and also by grinding the meal before one peptization. Operating details are given.

82 Elevation of the intrinsic viscosity of peanut protein by treatment with terephthalyl dichloride

1953

MANN, G. E. Amer. Chem. Soc. Jour. 75(14): 3526-3529. 1953.

Treatment of aqueous alkaline dispersions of peanut protein with the bifunctional acid chloride, terephthalyl dichloride ($\underline{p}$-$C_6H_4(COCl)_2$), results in modified proteins of elevated intrinsic viscosity as measured at 25.0°, using 10 $\underline{M}$ urea as the solvent. It also results in depression of the solubility of the protein in this solvent.

83 Note on the use of calcium hydroxide in the preparation of peanut protein

1953

POMINSKI, J., and Gordon, W. O. Amer. Oil Chem. Soc. Jour. 30(2): 88-89. 1953.

Laboratory peptizations showed that between pH of 7.2 and 9.5, nitrogen solubility obtained with calcium hydroxide solution was a constant, and was practically equal to the value obtained with sodium hydroxide solution at pH 7.5. Pilot-plant yields of protein and settling rates of protein curds also were equal.

84 Hard board from agricultural residues

1951

WILLIAMSON, R. V., and Lathrop, E. C. Modern Plastics 28(8): 126, 128, 130, 187. 1951.

Two processes for producing hard board from rice hulls, peanut shells, or flax shives were explored in a preliminary way by high temperature treatment of the ground residues and vinsol resins and by hot pressing a mixture of ground residue, phenolformaldehyde resin, and pine gum. Acceptable products, the properties of which are described, were obtained by both methods.

85 Nut shells and fruit pits--their composition, availability, agricultural and industrial uses

1953

CLARK, T. F., and Lathrop, E. C. U. S. Dept. Agr. AIC-352, 39 pp. (Processed.) February 1953.

The production, availability, composition, and physical characteristics of shells from almonds, coconuts, filberts, peanuts, pecans, English and black walnuts, and the pits from apricots, cherries, peaches, and dates are discussed. Agricultural and industrial uses for the various types of shell products are described. Factors involved in processing shells for commercial purposes are considered.

Peanut butter is one of the major outlets for peanuts in the United States. As is true for many food-processing operations, little systematic information was available about the effect of processing variables on the quality of the product.

So SRRL undertook a systematic investigation of the different steps involved in the manufacture of peanut butter. As a result of laboratory and pilot-plant investigations, reported in the articles mentioned in the following section, the peanut butter industry has available to it extensive basic information about the processes of manufacture which can be applied to improve still further the quality of peanut butter.

One pound of peanut butter contains more calories, protein, minerals, and vitamins than a pound of beefsteak.

36 Expansibility and specific volume of stabilized and unstabilized peanut butter

1950

SINGLETON, W. S., and Freeman, A. F. Food Res. 15(4): 297-301. 1950.

Peanut butter of 3 different compositions was examined dilatometrically. From data on expansibility and absolute density, absolute specific volume of each peanut butter was calculated for various temperatures from -38.6° to 70.0° C. No evidence of polymorphic transformations was obtained, regardless of rates of cooling of the samples. The reported data may be applied to the calculation of the shrinkage of peanut butter which may occur after packaging as a result of natural cooling of the product to room temperature.

37 Heat capacity of stabilized peanut butter

1950

WARD, T. L., Singleton, W. S., and Freeman, A. F. Food Res. 15(2): 146-149. 1950.

A calorimeter was modified and used to measure the heat capacity of peanut butter. The heat capacity of a sample of peanut butter which had been rapidly cooled after emerging from the grinding mill was 0.075 calorie per gram higher than the same sample when slowly cooled, up to the final melting of the added hard fat which was present in the sample. Identical heat capacities were observed above 19° C., regardless of the rate of cooling of the sample. An equation was developed for expressing the heat capacity of peanut butter in the range 20° to 80°, which is $\underline{C}_{\underline{p}} = 0.361 + 0.0012\,\underline{t}$.

38 Peanut butter. I. Roasting, cooling, blanching, and picking of peanuts

1952

WILLICH, R. K., Hall, A. S., Morris, N. J., and Freeman, A. F. Food Technol. 6(2): 71-73. 1952.

The times and temperatures required for roasting white Spanish peanuts from very light to very dark have been determined, and information has been obtained on the cooling, blanching, and manual sorting of 20 batches of peanuts in relation to their original moisture contents and to the quality of the final product.

89 Peanut butter. II. Effect of roasting and blanching on the thiamine content of peanut butter

1952

WILLICH, R. K., Murray, M. D., O'Connor, R. T., and Freeman, A. F. Food Technol. 6(6): 199-200. 1952.

Analyses of raw, shelled peanuts after removal of the testa showed that most of the thiamine was contained in the kernel. Peanut butters made from peanuts roasted to various extents contained only a relatively small proportion of the thiamine originally present in the kernel. With increase of roasting the amounts of thiamine were progressively smaller, while the color of the product became darker. Consequently, color becomes a visual indication of the extent of roasting, and indirectly of the loss of thiamine.

90 Peanut butter III. Effect of roasting, blanching, and sorting on oil content and free fatty acids of peanuts

1953

MORRIS, N. J., Willich, R. K., and Freeman, A. F. Food Technol. 7(9): 366-369. 1953.

Oil and the free fatty acids contents of the oils of raw and roasted peanuts, sorted cotyledons, germs, testa, and peanut butters were determined. Roasting, blanching, and manual sorting increased the apparent oil content of sorted peanuts about 1.5%, on the average for 20 batches. These operations led to reduction in free fatty acids of the sorted peanuts (on the average, about 0.1% less than for the corresponding raw, shelled peanuts). Peanut butters containing stabilizers as well as added salt showed increases in oil content as compared to butters with only added salt.

91 Peanut butter. IV. Determination of color of peanut butter by a spectral reflectance method

1953

MORRIS, N. J., Lohmann, I. J., O'Connor, R. T., and Freeman, A. F. Food Technol. 7(10): 393-396. 1953.

A reflectance spectrophotometric method was applied to measure the colors of 20 peanut butter samples, ranging in color from light to very dark. This technique affords an objective means of determining color, an important index of quality of peanut butter. Other methods used involve visual comparison, providing only a subjective measurement.

92 Determination of moisture in peanut butter

1953

PEPPER, M. B., Jr., and Freeman, A. F. Amer. Oil Chem. Soc. Jour. 30(8): 335-337.

The moisture and volatile contents of whole peanuts were determined by A.O.C.S. Official Method (Ab 2-49) and compared with the moisture content of the sliced peanuts determined by a toluene distillation procedure described by Tryon (Jour. Res. Natl. Bur. Standards 45 (5): 362-366. 1950). Moisture was determined by an oven loss-in-weight technique corresponding to conditions of A.O.C.S. Official Method (Ab 3-49) for "second" moisture, and by the toluene distillation method. Tyron's apparatus seems to make the toluene distillation procedure particularly adaptable to peanut butter. This information is presented to provide the peanut butter industry with an additional method for use in problems involving determination of small amounts of moisture and for comparison with other prevailing methods.

NOTE: Six additional publications reporting SRRL research on peanut butter will be available in 1954. One of these articles appeared in Food Technology, February 1954, entitled "Peanut Butter. V. The Effect of Processing and Storage of Peanut Butters on the Stabilities of their Oils," by R. K. Willich, N. J. Morris, and A. F. Freeman. The remainder are in press or in manuscript.

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